

CLAIMS

- 5 1. An oligonucleotide comprising from about 2 to about 100 nucleotides and containing at least one unmethylated CpG dinucleotide.
2. The oligonucleotide of claim 1 which is represented by the following
- 10 formula:



 wherein C and G are unmethylated, X_1 , X_2 , X_3 and X_4 are nucleotides and a GCG trinucleotide sequence is not present at or near the 5' and 3' termini.

- 15 3. The oligonucleotide of claim 2 having a phosphate backbone modification.
4. The oligonucleotide of claim 3 wherein the phosphate backbone
- 20 modification is a phosphorothioate backbone modification.
5. The oligonucleotide of claim 4 comprising the following nucleotide
- sequence:

25 5' GGGGTCAACGTTGAGGGGGG 3' (SEQ ID NO:1)

6. The oligonucleotide of claim 5 having a phosphate backbone
- modification.
- 30 7. The oligonucleotide of claim 6 wherein the phosphate backbone
- modification is a phosphorothioate modification.
8. An oligonucleotide delivery complex comprising the oligonucleotide of
- claim 1 and a targeting means.
- 35 9. An oligonucleotide delivery complex of claim 8, wherein the targeting
- means is selected from the group consisting of cholesterol, virosome,
- liposome, lipid, a target cell specific binding agent

10. A pharmaceutical composition comprising the oligonucleotide of claim 9 and a pharmaceutically acceptable carrier.
- 5 11. A pharmaceutical composition comprising the oligonucleotide of claim 2 and a pharmaceutically acceptable carrier.
12. A method for activating a subject's B cells comprising contacting the B cells with an effective amount of the oligonucleotide of claim 1.
- 10 13. A method for activating a subject's B cells comprising contacting the B cells with an effective amount of the oligonucleotide of claim 2.
- 15 14. A method for activating a subject's natural killer cells comprising contacting the natural killer cells with an effective amount of the oligonucleotide of claim 1.
- 20 15. A method for activating a subject's natural killer cells comprising contacting the natural killer cells with an effective amount of the oligonucleotide of claim 2.
- 25 16. A method for treating, preventing or ameliorating an immune system deficiency in a subject comprising administering to the subject an effective amount of a pharmaceutical composition of claim 10.
- 30 17. A method for treating, preventing or ameliorating an immune system deficiency in a subject comprising the steps of:
- a) contacting lymphocytes obtained from the subject with a composition of claim 1 ex vivo, thereby producing activated lymphocytes; and
 - b) readministering the activated lymphocytes obtained in step a) to the subject.
- 35 18. A method for vaccinating a subject comprising administering to the subject a composition of claim 10 in conjunction with administration of a vaccine.

- 5 19. A method for treating a disease associated with an immune system activation in a subject comprising administering to the subject an effective amount of a neutral oligonucleotide alone or in conjunction with a pharmaceutically acceptable carrier.
20. A method of claim 19 wherein the disease associated with immune system activation is systemic lupus erythematosus.
- 10 30. A method of claim 19 wherein the disease associated with immune system activation is sepsis.
- 15 31. An improved method for performing antisense therapy comprising methylating CpG containing oligonucleotides prior to administration to a subject.
- 20 32. An improved method for in vivo diagnoses using oligonucleotide probes comprising methylating CpG containing oligonucleotides prior to administration to a subject.
- 25 33. An oligonucleotide which is capable of interfering with the activity of viral or cellular transcription factors and containing a consensus immunoinhibitory CpG motif represented by the formula:
- $$5'GCGX_nGCG3'$$
- wherein X = a nucleotide and n = in the range of 0-50.
- 30 34. An oligonucleotide of claim 33, wherein X is a pyrimidine.
- 35 35. An oligonucleotide of claim 34, wherein X_n is a CpG dinucleotide
36. A method for treating or preventing a viral infection in a subject comprising administering to the subject an immunoinhibitory oligonucleotide of claim 33.